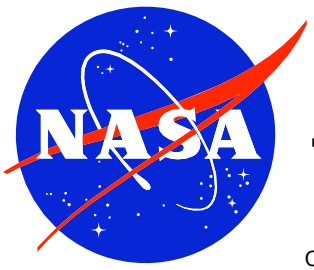
GAMMA-RAY LARGE AREA SPACE TELESCOPE (GLAST)

GLAST SCIENCE SUPPORT CENTER TEST PLAN

ORIGINAL

July 6, 2004



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NASA Goddard Space Flight Center

Greenbelt, Maryland

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GLAST SCIENCE SUPPORT CENTER
TEST PLAN

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1 PURPOSE

1.1 Verification of the GSSC Systems

The purpose of testing is to verify that the design of the GSSC satisfies the GSSC's requirements, as stated in the "GSSC Functional Requirements Document." Section 1.4 of the "Mission System Specification" (MSS) defines verification as:

> Verification—The process of proving that the implementation satisfies the requirement. The central question is whether the system is built right. The methods of showing compliance with requirements are Inspection, Demonstration, Analysis and Test, as defined above.

The MSS defines each of these methods as follows:

- Analysis—Predicted performance using calculations to show compliance with specified performance.
- Demonstration—Observed compliance of functional operation or behavior with that specified.
- Inspection—Visual proof of existence of specified characteristics or properties.
- Test—Measurement of performance to show compliance with specified performance or functionality.

The GSSC Functional Requirements Document (433-RQMT-0002) includes Appendix C which gives a verification method for each requirement. This appendix is the template for a verification matrix the GSSC will maintain documenting compliance with each requirement. The verification matrix to document requirement compliance is contained in the GSSC Verification Matrix Document (GSSC-0002) The GSSC Verification Matrix is controlled by the GSSC Configuration Control Board (CCB).

Requirements that are verified by demonstration often must wait for an event. For example, many of the requirements dealing with the Guest Investigator (GI) program will be satisfied only by administering the GI selection process. We can plan for that event, e.g., by allocating resources, but compliance is demonstrated only after the conclusion of the event. Satisfaction of the requirement will be noted on the verification matrix.

Similarly, some requirements will be verified by inspection, i.e., noting the "existence of specified characteristics or properties." For example, the existence of a GSSC website with certain information posted will satisfy a number of requirements. Periodically, the GSSC CCB will note on the verification matrix that a requirement has been verified by inspection.

Finally, many GSSC requirements will be verified by testing and analysis, the subject of this document. Since most of the testable requirements involve software, testing requirements is largely software testing.

1.2 Scope

This document assumes that the reader is familiar with the Ground System as detailed in the GLAST Project Data Management Plan (433-PDMP-0002) and the Mission Operations Concept Document (433-OPS-0001) as well as the GSSC design as described in the GSSC Design Document (GSSC-0003).

This document defines the plans and procedures for testing the internal software and procedures of the GLAST Science Support Center (GSSC), as well as the interfaces between the GSSC, the Instrument Operations Centers (IOCs) and the Mission Operations Center (MOC).

These plans cover the verification of GSSC functional requirements as well as the functionality and requirements of the individual components.

2 ACRONYMS

CCB	Configuration Control Board
DTS	Data Transfer System
ETE	End-to-End
FRD	GSSC Functional Requirements Document
FT1	FITS file format for LAT event data
FT2	FITS file format for LAT spacecraft data
GBM	GLAST Burst Monitor
GI	Guest Investigator
GIOC	GBM IOC
GLAST	Gamma-Ray Large Area Space Telescope
GRT	Ground Readiness Test
GSFC	Goddard Space Flight Center
GSRD	GLAST Ground System Requirements Document
GSSC	GLAST Science Support Center
GST	GSSC System Test
HEASARC	High Energy Astrophysics Science Archive Research Center
IOC	Instrument Operations Center
ISOC	LAT Instrument Science Operation Center
LAT	Large Area Telescope
LESDR	LAT Event Summary Database Requirements Document
MOC	Mission Operations Center
MSS	Mission System Specification

NASA	National Aeronautics and Space Administration
PDMP	Project Data Management Plan
PSS	Portable Spacecraft Simulator
SSC	Science Support Center
ST	Subsystem Test
STDR	Science Tools Database Requirements Document
TBD	To Be Determined
ToO	Target of Opportunity

3 GLOSSARY

Analysis—Predicted performance using calculations to show compliance with specified performance (MSS §1.4).

Archive—A collection of data that the HEASARC maintains in perpetuity as a record of the mission and for the use of the scientific community.

Database—A collection of data that the GSSC maintains for use by the GSSC and the community it serves during the GLAST mission.

Demonstration—Observed compliance of functional operation or behavior with that specified (MSS §1.4).

Inspection—Visual proof of existence of specified characteristics or properties (MSS §1.4).

Level 0 data—The raw data from the spacecraft after the telemetry packets have been time-ordered and repeated packets from a given spacecraft downlink have been removed. The data streams from the spacecraft and the instruments are separated. The processing that produces Level 0 data is called Level 0 processing.

Level 1 data—Data from which many of the instrumental artifacts have been removed and that are ready for astrophysical data analysis. LAT Level 1 data consist of reconstructed events. The processing that produces Level 1 data is called Level 1 processing.

Level 2 data—The results of analysis of Level 1 data such as spectral fits and source detections. The processing that produces Level 2 data is called Level 2 processing.

Level 3 data—Compendia of Level 2 data.

Verification—The process of proving that the implementation satisfies the requirement. The central question is whether the system is built right. The methods of showing compliance with requirements are Inspection, Demonstration, Analysis and Test, as defined above (MSS §1.4).

4 APPLICABLE DOCUMENTS

- GLAST Ground System Requirements Document (GSRD), 433-RQMT-0006
- Mission System Specification (MSS), 433-SPEC-0001
- Mission Operations Concept Document, 433-OPS-0001
- Science Requirements Document, 433-SRD-0001
- Ground System Test Plan
- Project Data Management Plan (PDMP), 433-DMP-0002
- GLAST Science Support Center Functional Requirements Document (FRD) 433-RQMT-0002
- GSSC Development Plan (GSSC-0001)
- GSSC Verification Matrix (GSSC-0002)
- GSSC Design Document (GSSC-0003)
- GSSC Software Management Plan (GSSC-0004)
- Report of the GLAST Data Products Working Group
- LAT Event Summary Database Requirements Document (LESDR)
- Science Tools Databases Requirements Document (STDR)

5 GSSC OVERVIEW

The GSSC is only one of a number of organizations that constitute the GLAST ground operations system, which is described in detail in other documents such as the PDMP and Operations Concept Documents. The GSSC is responsible for supporting the astronomical community's use of GLAST data by running the Guest Investigator (GI) program, disseminating GLAST data and results and providing analysis software and expertise. The GSSC is also responsible for the mission's timeline and archiving of mission data.

6 TESTING DESCRIPTION

6.1 Objectives

The objective of the system testing procedures is to verify the functional, operational and performance requirements of the GSSC software and procedures as defined in the various system requirements documents.

In addition to requirements verification, these tests include end-to-end testing to simulate the daily activities of the GSSC software and procedures during mission operation.

6.2 Test Types

There are several different types of testing that will be performed to insure correct operation of the GSSC's systems and procedures prior to launch.

6.2.1 Unit Tests

These test the basic functionality and requirements of the individual software units of the GSSC. They focus on the correct operation and robustness of the individual units in the presence of valid, invalid and incomplete data inputs. These include, but are not limited to, nightly software builds to verify that the software compiles and to execute diagnostic tests, regression testing and developer provided test routines and scripts.

Each unit will provide a test program or script. Guidelines for test construction and standard requirements for test programs' behavior will be determined by the Test Manager. The exact nature of a given unit's test program will be determined based on the complexity of the unit it tests and the requirements satisfied by that unit.

These unit tests must be run successfully after any changes to the unit's source code before the unit will be accepted into production code.

6.2.2 Subsystem Tests

These test GSSC procedures, larger software subsystems and internal GSSC communication links between subsystems as well as the performance of the GSSC subsystems. These include testing of data volume and throughput capabilities and response times of the various subsystems.

6.2.3 System Tests

These tests are used to simulate real operational scenarios to test the internal communication between the larger GSSC subsystems as well as communications between the GSSC and the MOC and IOCs and the handling of anomalous and error conditions.

6.3 Test Definitions

The requirements documents for the various components of the GSSC form the basis for the definitions of the system test sets and test cases. These test sets and cases are constructed in a manner to determine whether the GSSC system satisfies its specified requirements. The details of the exact test cases are determined by the designated testing team prior to conducting the test as defined in the timeline provided with each test.

6.4 Testing Procedures

The test sets and test cases documented in this test plan are high-level descriptions of tests to be performed in order to insure correct operations during the lifetime of the GSSC. Details of the individual tests are described elsewhere in the appropriate documents or defined by the test team prior to test execution. As part of each test the documentation for each component tested will be reviewed as well.

6.5 Analysis and Reporting

Most of the analysis to be performed during testing is the comparison of data files. Output data from individual tests are collected and analyzed by the test team to determine if the output files meet the predetermined criteria documented in the system test procedures.

The final report prepared after the completion of a test will consist of documentation detailing the hardware and software configuration used, the specific tests performed, success or failure of each test, a list of requirements that were satisfied by the test completion and a list of requirements unsatisfied because of failed tests. In addition, the report may contain any recommendations from the test team for improving or correcting the systems tested.

7 TESTING PERSONNEL

7.1 GSSC Test Manager

The design of testing procedures and all testing of the GSSC software and procedures will be overseen by the GSSC Test Manager. This involves among other things (1) managing design and implementation of test regimes for individual code modules and combinations of modules, (2) ensuring that the tests are used consistently to validate software integrity on an ongoing basis, and (3) tracking the results of third party tests (e.g., Users Committee evaluations, Data Challenges, etc.).

The GSSC Test Manager will be designated from the GSSC staff by the GSSC Manager and reports to the Software Manager. The Test Manager may participate in testing of any GSSC-developed LAT Science Analysis Software if requested by the LAT team.

7.2 GSSC Test Teams

A GSSC Test Team is constituted by the GSSC Test Manager to perform a specific set of tests of the GSSC software and procedures.

7.2.1 Team members

The members of the Test Team will be selected by the Test Manager from the GSSC staff. For any given test the members of the Test team should exclude the authors of the software being tested unless there is no other staff capable of performing the test.

7.2.2 Team organization

For each Test Team, one of the members will be appointed as the lead of the testing team. In no case should the author of the software being tested be appointed the team lead.

The team lead is responsible for organizing the team's activities to perform the test and insuring that the final report is drafted and submitted on time. It is the team lead's responsibility to organize the remaining members of the Test Team as needed to accomplish the assigned testing goals.

8 TEST PROCEDURES

8.1 Test Preparation

Several events need to occur before the actual testing can occur. It is the responsibility of the Test Team to see that each event occurs and is successfully completed. These events are:

1) Test Goals Defined – This document includes the general goals that each test is supposed to satisfy. The Test Team should expand these general goals into specific detailed goals for the tests they are conducting
2) Detailed Test Plan Prepared – Using the general test sets and test cases provided in this document, the Test Team should prepare a detailed list of the individual tests that will be performed in order to test the stated requirements and goals of the test. The list of tests to be performed should include any needed regression testing if the software has been successfully tested before. This detailed test plan will be the first part of the formal test report.
3) Software Identified – Prior to testing the software developers must provide an identified version of the software to be used in the test. Typically, this will consist of a tagged version of the software stored in the GSSC CVS repository. The nature of these tags are described in section 2.3.2.2 of the GSSC Software Management Plan (GSSC-0004). This version of the software will be the official version to be tested and released. Included in this software release is all the necessary documentation for installation and use.
4) Necessary Hardware Identified – Based on the documentation provided, the Test Team will determine the hardware necessary to complete the test and arrange for its use.
5) Prepare Test Data – The Test Team should identify what data are needed as input to the software for testing and prepare this data in advance of testing. Additionally, where the expected output is known or can be determined using alternate methods, it should be prepared in advance as well to check the output of the tests.

While there can be some variation depending on the size and scope of the test being performed, these events typically should be completed according to the following timeline:

Test Preparation Step	Completion Date
Test Goals Defined	T-3 weeks
Detailed Test Plan Prepared	T-3 weeks
Software Identified	T-2 weeks
Hardware Identified	T-2 weeks
Test Data Prepared	T-1 week

Once these steps have been completed, the actual testing can begin.

8.2 Configure and Build Software

The first step of the testing is to actually download, build if necessary, and install the software that will be tested. The members of the test team will check out the software from the repository, build it on the test platforms and configure it for the test. During this portion of the test, the documentation concerning building and installation of the software will be reviewed. This step should be completed in the week prior to the start of actual testing.

8.3 Test Execution

After the software and hardware are properly configured, the detailed testing of the software begins. During this stage, all of the tests defined in the prepared test plan are performed and verified for the proper results. The success or failure of each detailed test is recorded as well as the results of any performance testing conducted. Additionally, the documentation for the software is reviewed for completeness. Typically, this stage should take no longer than one week.

8.4 Initial Test Report

Once the initial testing is complete the Test Team will prepare an initial test report describing the results of the test. This initial test report should describe all of the test failures and issues that need to be resolved before the test can be considered successful. It may also include suggestions for issue resolution.

This report should be completed and presented to the GSSC Test Manager no later than one week after testing has been completed to allow time to correct any errors discovered and retest before the release date. However, if there were significant problems that need to be addressed these issues should be made known to the software developers immediately so that corrections to the software can be started as soon as possible.

8.5 Issue Resolution

From the initial test report, the Test Manager, together with the Test Team lead, will create a list of issues to be resolved before the software can be released. These issues will be assigned and tracked using the GSSC's issue tracking system. The issues will be assigned to the appropriate developers for resolution. These issues should be resolved by no later than one week before the scheduled release date. Once these issues have been corrected, the software will be retested.

8.6 Retesting of Software

Once corrections have been made by the developers, the test team will rerun the tests in order to insure proper operation of the software and that all raised issues have been resolved. The corrections made and the results of the rerun tests will be appended to the final test report. The retesting should begin as soon as issues for a given test case are resolved and be completed no later than one week before the scheduled release date.

8.7 Final Test Report

Once the testing is complete a report of the results will be made. As described in section 6.5, this report will include descriptions of the hardware and software configurations used in the test, the detailed list of tests performed, a list of test objectives met and descriptions of any problems encountered during testing. It should also include a list of the GSSC requirements determined to have been met by the successful completion of the tests and those requirements covered by the tests that were not satisfied. The Test Team may also include any recommendations for system improvement.

As appendices to the report the Test Team should include a list of files used for input and the resultant output of all tests. This data will be used in future tests for regression testing. The appendices should also include the issue resolution reports for all issues closed during the test period.

8.8 Release Software

Once the tests have been successfully completed, the software will be certified and released for general use. Once released, all future changes and modifications to the software will be controlled by the CCB.

9 DISCREPANCY MANAGEMENT

9.1 Issue Tracking

Any errors or discrepancies found during testing will be entered into the GSSC's issue tracking system described in section 3.5 of the GSSC Software Management Plan (GSSC-0004). Additionally, any software enhancements or modifications suggested by the testing team will be entered into this tracking system with the appropriate priorities.

9.2 Issue Assignment

The Test Manager, together with the Software Manager for new software and the CCB for previously released software, are responsible for determining the criticality of each issue and making issue resolution assignments to the GSSC staff. Generally, the issues will be assigned to the developer of the tested software for resolution. However, in some cases it may be necessary to assign the issue to another staff member.

9.3 Issue Resolution

Any issues generated as part of the GSSC testing that are deemed critical for software release must be completed at least one week before the scheduled release date to allow for retesting of the software before release. Once the software has been modified to resolve the issue, the assigned staff should notify the Test Manager that the issue has been resolved and submit a short report detailing what was done to correct the problem.

9.4 Reporting

For each issue that is resolved the responsible staff member will submit a short report detailing what steps were taken to resolve the issue. This report will become part of the final testing report for the test which generated the issue. This report should be submitted to the Test Manager no later than one week before the scheduled release date.

9.5 Issue Closure

Once an issue has been reported as corrected to the Test Manager, the testing team will retest the software to verify that the previously detected errors have been corrected. Once the software passes these tests, the issue will be deemed resolved and marked as such by the Test Manager after receiving the final testing report. Once an issue has been resolved, it will be officially closed by the Software Manger in the case of unreleased software or the CCB in the case of released software.

10 TEST SPECIFICATIONS

10.1 Overview

This section specifies the tests that need to be performed on the GSSC software both prior to launch and during science operations in order to assure that the systems are ready to handle the data and data flow. These test descriptions are currently incomplete and will be completed as the detailed design of the various subsystems are completed.

10.2 Unit Tests

These tests are defined by the unit developers to verify the functionality of the individual components of the GSSC systems and as such are not delimited in this document. These tests will be executed as part of the GSSC's nightly build system.

Some examples of units that are to be tested include:

- Individual components of the D1 and D2 Database
- U1/U3 Web interface
- Queue Manager
- Orbit simulator
- Individual Operations tools
- Individual Proposal Planning tools
- Individual Ingest Pipeline modules

10.3 Subsystem Tests

These tests are designed to verify the smooth flow and correct handling of data and information within the various components of the GSSC's software subsystems. A general description of the tests to be performed are provided as part of this document. The details of the tests are determined by the test team responsible for performing the specified test.

Data for the Subsystem Tests should include valid data as well as data that are bad, corrupted or otherwise invalid to test the systems response to incorrect data. As part of the Subsystem Tests, the Unit Tests for all tested software should be performed. Since this holds for all of the Subsystem Tests, the Unit Tests are not explicitly listed in the test cases for each Subsystem Test.

10.3.1 Subsystem Test 1 (ST1) – D1 Photon Database

10.3.1.1 Purpose
Ensure the proper communication between the various components of the D1 photon database system and verify proper functionality of the entire system

10.3.1.2 Description
This test set verifies that the D1 photon database system can properly ingest and return Level 1 LAT photon data. It verifies proper ingest of data, the proper data return format and the performance requirements for the D1 photon database.

10.3.1.3 Dependencies
All unit tests of the D1 photon database components must have been successfully completed prior to ST1.

10.3.1.4 Expected Results
- New data properly ingested into database
- Reprocessed data properly ingested into database
- Query times meet requirements
- Query data returned in proper format

10.3.1.5 Resources Required
- Sample Level 1 LAT photon data for ingest
- Web site
- FTP site
- Linux platform for Queue Manager and Ingest program
- Linux cluster for Database Server

10.3.1.6 Special Setup Requirements
There must be a staging/ingest disk that is cross mounted between the platform running the Ingest program and the head node of the Linux cluster for file passing.

10.3.1.7 Test Method

Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
LESDR 5.2.3.3 LESDR 5.2.3.4	1.01	Ingest of new data	
LESDR 5.2.3.4.2	1.02	Ingest of reprocessed data	
LESDR 5.2.3.1 LESDR 5.2.3.1.1 LESDR 5.2.3.1.2 LESDR 5.2.3.2.1 LESDR 5.2.3.2.2	1.03	Standard data query	Data returned in FT1 format
LESDR 5.2.3.1.3	1.04	Standard query with additional cuts	Data returned in FT1 format
LESDR 5.2.3.1.4	1.05	Large Query	Data returned in FT1 format
LESDR 5.2.3.4.3	1.06	Rebuild Database after crash	
FRD 5.1.3 FRD 5.1.4	1.07	Proper Units and coordinate systems	

10.3.2 Subsystem Test 2 (ST2) – D1 Event Database

10.3.2.1 Purpose
Ensure the proper communication between the various components of the D1 Event database system and verify proper functionality of the entire system

10.3.2.2 Description
This test set verifies that the D1 event database system can properly ingest and return Level 1 LAT event data. It verifies proper ingest of data, the proper data return format and the performance requirements for the D1 event database.

10.3.2.3 Dependencies
All unit tests of the D1 event database components must have been successfully completed prior to ST2.

10.3.2.4 Expected Results
- New data properly ingested into database
- Reprocessed data properly ingested into database
- Query times meet requirements
- Query data returned in proper format

10.3.2.5 Resources Required
- Sample Level 1 LAT event data for ingest
- Web site
- FTP site
- Linux platform for Queue Manager and Ingest program
- Linux cluster for Database Server

10.3.2.6 Special Setup Requirements
There must be a staging/ingest disk that is cross mounted between the platform running the Ingest program and the head node of the Linux cluster for file passing.

10.3.2.7 Test Method

Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
LESDR 5.2.4.3 LESDR 5.2.4.4.1	2.01	Ingest of new data	
LESDR 5.2.4.4.3	2.02	Ingest of reprocessed data	
LESDR 5.2.4.1.1 LESDR 5.2.4.1.2 LESDR 5.2.4.2.1 LESDR 5.2.4.2.3	2.03	Standard data query	Data returned in FT1 format
LESDR 5.2.4.1.3	2.04	Standard query with additional cuts	Data returned in FT1 format
LESDR 5.2.4.1.4	2.05	Large Query	Data returned in FT1 format
LESDR 5.2.4.4.3	2.06	Rebuild Database after crash	
FRD 5.1.3 FRD 5.1.4	2.07	Proper Units and coordinate systems	

10.3.3 Subsystem Test 3 (ST3) – D2 Pointing, Livetime and Mode History Database

10.3.3.1 Purpose
Ensure the proper communication between the various components of the D2 database system and verify proper functionality of the entire system

10.3.3.2 Description
This test set verifies that the D2 database system can properly ingest and return Level 1 spacecraft history data. It verifies proper ingest of data, the proper data return format and the performance requirements for the D2 database.

10.3.3.3 Dependencies
All unit tests of the D2 database components must have been successfully completed prior to ST3.

10.3.3.4 Expected Results
- New data properly ingested into database
- Reprocessed data properly ingested into database
- Query times meet requirements
- Query data returned in proper format

10.3.3.5 Resources Required
- Sample Level 1 LAT Pointing, Livetime and Mode History data for ingest
- Web site
- FTP site
- Linux platform for Queue Manager and Ingest program
- Linux platform for Database Server

10.3.3.6 Special Setup Requirements
There must be a staging/ingest disk that is cross mounted between the platform running the Ingest program and the platform running the server for staging of data.

10.3.3.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
STDR 5.4.1.2 STDR 5.4.1.5.1	3.01	Ingest of new data	
STDR 5.4.1.5.3	3.02	Ingest of reprocessed data	
STDR 5.4.1.3 STDR 5.4.1.4 STDR 5.4.1.5.2	3.03	Standard data query	Data returned in FT2 format
STDR 5.4.1.5.4	3.04	Rebuild Database after crash	
FRD 5.1.3 FRD 5.1.4	3.05	Proper Units and coordinate systems	

10.3.4 Subsystem Test 4 (ST4) – Data Transfer to/from MOC

10.3.4.1 Purpose
Verify that the GSSC systems that communicate with the MOC send and receive data in the proper format and function properly in the presence of valid, invalid and incomplete data from the MOC.

10.3.4.2 Description
This test set verifies the proper functionality of the data transfer system used to transfer data to/from the MOC.

10.3.4.3 Dependencies
None.

10.3.4.4 Expected Results
Successful transfer of files between data transfer nodes and proper execution of all post transfer scripts.

10.3.4.5 Resources Required
- Two independent computers each configured with the data transfer system to be used.
- Disk space sufficient to hold transferred files
- Set of files of various sizes to transfer

10.3.4.6 Special Setup Requirements
If DTS is used, it requires system administrators to set up the necessary computer accounts.

10.3.4.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.6	4.01	UTC Time system	
FRD 5.7.1.5	4.02	Data Throughput analysis	

10.3.5 Subsystem Test 5 (ST5) – Data Transfer to/from ISOC

10.3.5.1 Purpose
Verify that the GSSC systems that communicate with the ISOC send and receive data in the proper format and function properly in the presence of valid, invalid and incomplete data from the ISOC.

10.3.5.2 Description
This test set verifies the proper functionality of the data transfer system used to transfer data to/from the ISOC.

10.3.5.3 Dependencies
None.

10.3.5.4 Expected Results
Successful transfer of files between data transfer nodes and proper execution of all post transfer scripts.

10.3.5.5 Resources Required
- Two independent computers each configured with the data transfer system to be used.
- Disk space sufficient to hold transferred files
- Set of files of various sizes to transfer

10.3.5.6 Special Setup Requirements
If DTS is used, it requires system administrators to set up the necessary computer accounts.

10.3.5.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.6	5.01	UTC Time system	
FRD 5.7.1.5	5.02	Data Throughput analysis	

10.3.6 Subsystem Test 6 (ST6) –Data Transfer to/from GIOC

10.3.6.1 Purpose
Verify that the GSSC systems that communicate with the GIOC send and receive data in the proper format and properly function in the presence of valid, invalid and incomplete data from the GIOC.

10.3.6.2 Description
This test set verifies the proper functionality of the data transfer system used to transfer data to/from the GIOC.

10.3.6.3 Dependencies
None.

10.3.6.4 Expected Results
Successful transfer of files between data transfer nodes and proper execution of all post transfer scripts.

10.3.6.5 Resources Required
- Two independent computers each configured with the data transfer system to be used.
- Disk space sufficient to hold transferred files
- Set of files of various sizes to transfer

10.3.6.6 Special Setup Requirements
If DTS is used, it requires system administrators to set up the necessary computer accounts.

10.3.6.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.6	6.01	UTC Time system	
FRD 5.7.1.5	6.02	Data Throughput analysis	

10.3.7 Subsystem Test 7 (ST7) – Database Ingest I

10.3.7.1 Purpose
Verify that the general GSSC Ingest Pipeline Manager software is functioning correctly and verify the proper ingest of the Level 0 MOC data.

10.3.7.2 Description
This test verifies that the Ingest Pipeline is properly set up and accessible and that the modules to handle the receipt of new data and ingest of Level 0 data from the MOC function properly.

10.3.7.3 Dependencies
None.

10.3.7.4 Expected Results
- Data entering pipeline are logged and processed properly.
- Level 0 data are properly archived and database is updated.

10.3.7.5 Resources Required
- Computer to host Ingest Pipeline Manager (OPUS) and Ingest modules
- Computer hosting MySQL server.

10.3.7.6 Special Setup Requirements
- MySQL Server needs proper tables created
- OPUS only runs on RedHat Linux 8 or later

10.3.7.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	7.01	Proper Units and coordinate systems	
FRD 5.7.1.6	7.02	General new data ingest	
FRD 5.7.1.1	7.03	Level 0 data Ingest	

10.3.8 Subsystem Test 8 (ST8) – Database Ingest II

10.3.8.1 Purpose
Verify that the Ingest Pipeline modules for the TDRSS Ephemeris and Observatory Telemetry and Command Databases have the proper functionality

10.3.8.2 Description
This test set verifies that the ingest modules for the TDRSS Ephemeris and Observatory Telemetry and Command Databases are executed properly by the Ingest Pipeline and properly update the appropriate databases. These modules include the Op45 and Op60 tools as described in the GSSC Design Document

10.3.8.3 Dependencies
ST7 – Database Ingest I completes successfully.

10.3.8.4 Expected Results

10.3.8.5 Resources Required
- Computer to host Ingest Pipeline Manager (OPUS) and Ingest modules
- Computer hosting MySQL server.
- Sample files for all databases to be updated as described in Sections 6.5 & 6.7 of GSSC Design Document (GSSC-0004)

10.3.8.6 Special Setup Requirements
- MySQL Server needs proper tables created
- OPUS only runs on RedHat Linux 8 or later

10.3.8.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	8.01	Proper Units and coordinate systems	
FRD 5.4.1.4.13	8.02	TDRSS Ephemeris Ingest	Updated Ephemeris for Scheduling tool
	8.03	Observatory Telemetry and Command Updates Ingest	

10.3.9 Subsystem Test 9 (ST9) – Database Ingest III

10.3.9.1 Purpose
Verify that the tested ingest modules function properly.

10.3.9.2 Description
This test set verifies the proper functionality of the ingest modules for the following databases:
- GLAST Ephemeris
- Integrated Observatory Timeline
- TDRSS Contact Schedule
- GCN notices

These modules include the Op40, Op50 and Op20 tools.

10.3.9.3 Dependencies
ST7 – Database Ingest I completes successfully.

10.3.9.4 Expected Results

10.3.9.5 Resources Required
- Computer to host Ingest Pipeline Manager (OPUS) and Ingest modules
- Computer hosting MySQL server.
- Sample files for all databases to be updated as described in Sections 6.2, 6.4 & 6.6 of GSSC Design Document (GSSC-0004)

10.3.9.6 Special Setup Requirements
- MySQL Server needs proper tables created
- OPUS only runs on RedHat Linux 8 or later

10.3.9.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	9.01	Proper Units and coordinate systems	
FRD 5.4.1.4.12	9.02	Integrated Observatory Timeline Ingest	
FRD 5.4.1.4.13	9.03	GLAST Ephemeris Ingest	Updated ephemeris for Scheduling tool
FRD 5.4.1.4.10	9.04	TDRSS Proposed Contact Ingest	
FRD 5.4.1.4.11	9.05	TDRSS Contact Ingest	Updated TDRSS schedule for Scheduling tool
FRD 5.7.1.8	9.06	GCN Notices capture	
FRD 5.7.1.8	9.07	GCN Notices Ingest	
FRD 5.7.1.8	9.08	GCN Circular capture	
FRD 5.7.1.8	9.09	GCN Circular Ingest	

10.3.10 Subsystem Test 10 (ST10) – Database Ingest IV

10.3.10.1 Purpose

Verify that the tested ingest modules function properly.

10.3.10.2 Description

This test set verifies the proper functionality of the ingest modules for the following science data products received from the GIOC:

- GS-001 CTIME (daily version)
- GS-002 CSPEC (daily version)
- GS-004 GBM housekeeping
- GS-005 GBM gain and energy resolution history
- GS-006 GLAST position and attitude history
- GS-007 GBM PHA Look-up tables
- GS-008 GBM Calibration
- GS-101 CTIME (burst version)
- GS-102 CSPEC (burst version)
- GS-103 GBM TTE
- GS-104 GBM DRMs
- GS-106 Preliminary GBM Burst Catalog Entry
- GS-107 GBM TRIGDAT
- GS-108 GBM Background Files
- GS-206 GBM Burst Catalog
- GS-207 GBM Trigger Catalog
- GS-306 GBM Burst Spectra Catalog

10.3.10.3 Dependencies

ST7 – Database Ingest I completes successfully.

10.3.10.4 Expected Results

10.3.10.5 Resources Required

- Computer to host Ingest Pipeline Manager (OPUS) and Ingest modules
- Computer hosting MySQL server.
- Sample files for all databases to be updated

10.3.10.6 Special Setup Requirements

- MySQL Server needs proper tables created
- OPUS only runs on RedHat Linux 8 or later

10.3.10.7 Test Method

Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	10.01	Proper Units and coordinate systems	
	10.02	GS-001 CTIME (daily version) Ingest	
	10.03	GS-002 CSPEC (daily version) Ingest	
	10.04	GS-004 GBM Housekeeping Ingest	
	10.05	GS-005 GBM gain and energy resolution history Ingest	
	10.06	GS-006 GLAST position and attitude history Ingest	
	10.07	GS-007 GBM PHA Look-up Tables Ingest	
	10.08	GS-008 GBM Calibration Ingest	
	10.09	GS-101 CTIME (burst version) Ingest	
	10.10	GS-102 CSPEC (burst version) Ingest	
	10.11	GS-103 GBM TTE Ingest	
	10.12	GS-104 GBM DRMs Ingest	
	10.13	GS-106 Preliminary GBM burst catalog entry Ingest	
	10.14	GS-107 GBM TRIGDAT Ingest	
	10.15	GS-108 GBM Background files Ingest	
	10.16	GS-206 GBM Burst Catalog Ingest	
	10.17	GS-207 GBM Trigger Catalog Ingest	
	10.18	GS-306 GBM Burst Spectra Catalog Ingest	

10.3.11 Subsystem Test 11 (ST11) – Database Ingest V

10.3.11.1 Purpose
Verify that the tested ingest modules function properly.

10.3.11.2 Description
This test set verifies the proper functionality of the ingest modules for the following science products received from the ISOC:

- LS-002 LAT Events
- LS-005 Pointing and Livetime history
- LS-004 LAT IRFs
- LS-009 LAT burst Catalog
- LS-008 LAT Point source Catalog
- LS-010 Interstellar Emission Model
- LS-007 Lat Transient Data
- LS-003 Low-Level calibration
- LS-006 LAT Configuration History
- D1ph Photon Database (derived from LS-002 by GSSC)

10.3.11.3 Dependencies
ST7 – Database Ingest I completes successfully.

10.3.11.4 Expected Results

10.3.11.5 Resources Required
- Computer to host Ingest Pipeline Manager (OPUS) and Ingest modules
- Computer hosting MySQL server.
- Sample files for all databases to be updated

10.3.11.6 Special Setup Requirements
- MySQL Server needs proper tables created
- OPUS only runs on RedHat Linux 8 or later

10.3.11.7 Test Method

Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	11.01	Proper Units and coordinate systems	
	11.02	LS-002 LAT Events Ingest	
	11.03	D1ph Photon Database Ingest	
	11.04	LS-005 Pointing and Livetime History Ingest	
	11.05	LS-004 LAT IRFs Ingest	
	11.06	LS-009 LAT Burst Catalog Ingest	
	11.07	LS-008 LAT Point source Catalog Ingest	
	11.08	LS-010 Interstellar Emission Model Ingest	
	11.09	LS-007 LAT Transient Data Ingest	
	11.10	LS-003 Low-Level Calibration Ingest	
	11.11	LS-006 LAT Configuration History Ingest	

10.3.12 Subsystem Test 12 (ST12) – Database Ingest VI

10.3.12.1 Purpose
Verify that the tested ingest modules function properly.

10.3.12.2 Description
This test set verifies the proper functionality of the ingest modules for the following databases:
- As flown timeline
- Proposal Database

These modules include the Op10 and Op160 tools.

10.3.12.3 Dependencies
ST7 – Database Ingest I completes successfully.

10.3.12.4 Expected Results

10.3.12.5 Resources Required
- Computer to host Ingest Pipeline Manager (OPUS) and Ingest modules
- Computer hosting MySQL server.
- Sample files for all databases to be updated as described in Sections 6.1 & 6.17 of GSSC Design Document (GSSC-0004)

10.3.12.6 Special Setup Requirements
- MySQL Server needs proper tables created
- OPUS only runs on RedHat Linux 8 or later

10.3.12.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	12.01	Proper Units and coordinate systems	
FRD 5.4.1.4.14	12.02	As-Flown Timeline Ingest	
	12.03	Proposal Ingest	

10.3.13 Subsystem Test 13 (ST13) – Database Ingest VII

10.3.13.1 Purpose
Verify that the tested ingest modules function properly.

10.3.13.2 Description
This test set verifies the proper functionality of the ingest modules for the Anomaly Reports database. These modules include the Op30 tool.

10.3.13.3 Dependencies
ST7 – Database Ingest I completes successfully.

10.3.13.4 Expected Results

10.3.13.5 Resources Required
- Computer to host Ingest Pipeline Manager (OPUS) and Ingest modules
- Computer hosting MySQL server.
- Sample files for all databases to be updated as described in Section 6.3 of GSSC Design Document (GSSC-0004)

10.3.13.6 Special Setup Requirements
- MySQL Server needs proper tables created
- OPUS only runs on RedHat Linux 8 or later

10.3.13.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	13.01	Proper Units and coordinate systems	
	13.01	Anomaly Reports Ingest	

10.3.14 Subsystem Test 14 (ST14) – Database Ingest VIII

10.3.14.1 Purpose
Verify that the tested ingest modules function properly.

10.3.14.2 Description
This test set verifies the proper functionality of the ingest modules for the following databases:
- Notifications, Acknowledgments and Dispositions
- D4 Pulsar Ephemeredes
- SAA Definition Updates - LAT
- SAA Definition Updates - GBM

10.3.14.3 Dependencies
ST7 – Database Ingest I completes successfully.

10.3.14.4 Expected Results

10.3.14.5 Resources Required
- Computer to host Ingest Pipeline Manager (OPUS) and Ingest modules
- Computer hosting MySQL server.
- Sample files for all databases to be updated

10.3.14.6 Special Setup Requirements
- MySQL Server needs proper tables created
- OPUS only runs on RedHat Linux 8 or later

10.3.14.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	14.01	Proper Units and coordinate systems	
	14.02	Notifications, Acknowledgements and Dispositions Ingest	
	14.03	D4 Pulsar Ephemerides Ingest	
	14.04	SAA Definition Updates – LAT Ingest	
	14.05	SAA Definition Updates – GBM Ingest	

10.3.15 Subsystem Test 15 (ST15) – Commanding I

10.3.15.1 Purpose
Verify proper functionality of the Operations tools associated with commanding the spacecraft.

10.3.15.2 Description
This test set verifies the proper functionality of the Command Ingest (Op70), Command Submit (Op80) and Science Timeline Submission (Op110) tools.

10.3.15.3 Dependencies

10.3.15.4 Expected Results

10.3.15.5 Resources Required
- Sample files specified in Sections 6.8, 6.9 and 6.12 of GSSC Design Document (GSSC-0004)

10.3.15.6 Special Setup Requirements

10.3.15.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.6	15.01	UTC Time	
FRD 5.4.1.6.1	15.02	Receive Absolute Time Command	
FRD 5.4.1.6.2	15.03	Receive Real Time Command	
FRD 5.4.1.6.3	15.04	High Priority Command Pass-Through	
FRD 5.4.1.6.1 FRD 5.4.1.6.2	15.05	Command Submission	
FRD 5.4.1.4.5 FRD 5.4.1.4.6	15.06	Timeline Submission	
FRD 5.4.1.6.4	15.07	Command Integrity Test	
FRD 5.4.1.6.5	15.08	Command Logging	

10.3.16 Subsystem Test 16 (ST16) – Commanding II

10.3.16.1 Purpose
Verify proper functionality of the Operations tools associated with commanding the spacecraft.

10.3.16.2 Description
This test set verifies the proper functionality of the TOO Orderer (Op120), TOO Evaluator (Op150) and Pager (Op140) tools.

10.3.16.3 Dependencies

10.3.16.4 Expected Results

10.3.16.5 Resources Required
- Sample files specified in Sections 6.15 and 6.16 of GSSC Design Document (GSSC-0004)

10.3.16.6 Special Setup Requirements

10.3.16.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.6	16.01	UTC Time	
FRD 5.4.1.5.3	16.02	Generate TOO Order	
FRD 5.4.1.5.5	16.03	Log TOO Order	
	16.04	TOO Evaluation	
	16.05	Paging Test	

10.3.17 Subsystem Test 17 (ST17) – Scheduling

10.3.17.1 Purpose
Verify that the Science Timeline Generation tool has the proper functionality

10.3.17.2 Description
This test set verifies that the Science Timeline Generation tool (Op100) functions properly.

10.3.17.3 Dependencies

10.3.17.4 Expected Results

10.3.17.5 Resources Required
- Sample files specified in Sections 6.11 of GSSC Design Document (GSSC-0004)

10.3.17.6 Special Setup Requirements

10.3.17.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.6	17.01	UTC Time	
FRD 5.4.1.1.2 FRD 5.4.1.4.5 FRD 5.4.1.4.6	17.02	Scheduling Test	

10.3.18 Subsystem Test 18 (ST18) – Planning

10.3.18.1 Purpose
Verify the proper functionality of the various planning tools.

10.3.18.2 Description
This test set verifies that the Planning Tool (Op90), the GSSC Observation Planning tools (S-00,S-01,S-02 and S-03) and the Sky coverage monitor function properly.

10.3.18.3 Dependencies

10.3.18.4 Expected Results

10.3.18.5 Resources Required
- Sample files specified in Sections 6.10 of GSSC Design Document (GSSC-0004)

10.3.18.6 Special Setup Requirements

10.3.18.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.6	18.01	UTC Time	
FRD 5.4.1.1 FRD 5.3.2.1	18.02	Planning Test –Survey Mode	
FRD 5.4.1.1 FRD 5.3.2.1	18.03	Planning Test – Pointed Mode	

10.3.19 Subsystem Test 19 (ST19) – Web Interface I

10.3.19.1 Purpose
Verify proper functionality of the test web interface components.

10.3.19.2 Description
This test set verifies the proper functionality of the following components of the web interface:

- GI Proposal Submission Interface (S-21)
- ToO Proposal Submission Interface (S-31)
- LAT Observation Request Interface (S-41)
- LAT Diffuse Emission Display (S-53)
- Help Desk Question Submission (S-61)
- Help Desk Response Administration (S-62)
- FAQ Access (S-63)

10.3.19.3 Dependencies

10.3.19.4 Expected Results

10.3.19.5 Resources Required

10.3.19.6 Special Setup Requirements

10.3.19.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.2.8	19.01	Section 508 Compliance	

10.3.20 Subsystem Test 20 (ST20) – Web Interface II

10.3.20.1 Purpose
Verify proper functionality of the test web interface components.

10.3.20.2 Description
This test set verifies the proper functionality of the following components of the web interface:

- Weekly Timeline Display (S-11)
- Annual Timeline Display (S-12)
- As flown Timeline Display (S-13)
- Approved ToO Display (S-32)
- GRB Lightcurve Display (S-55)
- GCN Post (S-56)

10.3.20.3 Dependencies

10.3.20.4 Expected Results

10.3.20.5 Resources Required

10.3.20.6 Special Setup Requirements

10.3.20.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.2.8	19.01	Section 508 Compliance	

10.3.21 Subsystem Test 21 (ST21) – GSSC User Support Tools I

10.3.21.1 Purpose
Verify proper functionality of the GSSC specific User Support tools

10.3.21.2 Description
This test set verifies that the GSSC specific tools that form the back end of many of the web interfaces have the proper functionality. The tools tested include:
- Source Sensitivity Calculator (S-01)
- Orbit Simulator (S-03)

10.3.21.3 Dependencies

10.3.21.4 Expected Results

10.3.21.5 Resources Required

10.3.21.6 Special Setup Requirements

10.3.21.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	21.01	Proper Units and Coordinate Systems	

10.3.22 Subsystem Test 22 (ST22) – GSSC User Support Tools II

10.3.22.1 Purpose
Verify proper functionality of the GSSC specific User Support tools

10.3.22.2 Description
This test set verifies that the GSSC specific tools that form the back end of many of the web interfaces have the proper functionality. The tools tested include:

- Exposure Analyzer (S-02)
- Count Map Generator (S-51)
- Exposure Map Generator (S-52)
- GRB Map Display (S-54)

10.3.22.3 Dependencies

10.3.22.4 Expected Results

10.3.22.5 Resources Required

10.3.22.6 Special Setup Requirements

10.3.22.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results
FRD 5.1.3 FRD 5.1.4 FRD 5.1.6	22.01	Proper Units and Coordinate Systems	

10.3.23 Subsystem Test 23 (ST23) – GBM Backup Pipeline

10.3.23.1 Purpose
Verify that the GBM backup pipeline hosted by the GSSC functions properly.

10.3.23.2 Description
This test set verifies that the GBM backup pipeline at the GSSC has the proper functionality and produces the same output data as the primary pipeline at the GIOC.

10.3.23.3 Dependencies

10.3.23.4 Expected Results

10.3.23.5 Resources Required

10.3.23.6 Special Setup Requirements

10.3.23.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results

10.3.24 Subsystem Test 24 (ST24) – LAT Backup Pipeline

10.3.24.1 Purpose
Verify that the LAT backup pipeline hosted by the GSSC functions properly.

10.3.24.2 Description
This test set verifies that the LAT backup pipeline at the GSSC has the proper functionality and produces the same output data as the primary pipeline at the ISOC.

10.3.24.3 Dependencies

10.3.24.4 Expected Results

10.3.24.5 Resources Required

10.3.24.6 Special Setup Requirements

10.3.24.7 Test Method
Functional and performance tests verified by test execution and demonstration

Requirements	Test Case	Test Description	Additional Results

10.4 System Tests

The System Tests check the ability of the GSSC's software systems to interface with the Ground System elements outside of the GSSC and provide real-world scenario testing of the system functionality in tests designed to simulate typical operational conditions.

10.4.1 GSSC System Tests (GST)

The GSSC System tests are tied to the software releases described in the GSSC Development Plan (GSSC-0001). They represent the formal final testing of software before the official software release. These tests consist of a battery of Subsystem Tests that test all of the necessary subsystems affected by the software release.

10.4.1.1 GST1 (10/01/04)

Tied to Software Release 1 (11/15/04). Will test software and procedures for moving data from MOC to GSSC, ingest of MOC level 0 data and the help desk submission form.

Included Unit Tests:
- Help Desk Question Submission (W-26)

Included Subsystem tests:
- ST4 – Data Transfer to/from MOC
- ST7 – Database Ingest I

Requirements Satisfied
- FRD 5.1.3, 5.1.4, 5.1.6
- FRD 5.2.4
- FRD 5.3.3.3.4
- FRD 5.4.1.4.1
- FRD 5.4.1.6.6, 5.4.1.6.7
- FRD 5.7.1.1.6

10.4.1.2 GST2 (12/15/04)

Tied to Software Release 2 (02/01/05). Will test software and procedures for data transfer and command passing from IOCs to GSSC and GSSC to MOC, database ingest for the transferred data products and science timeline submission tools.

Included Subsystem tests:
- ST5 – Data Transfer to/from GIOC
- ST6 – Data Transfer to/from ISOC
- ST8 – Database Ingest II
- ST15 – Commanding I

Requirements Satisfied
- FRD 5.1.3, 5.1.4, 5.1.6
- FRD 5.4.1.4.2, 5.4.1.4.5, 5.4.1.4.6, 5.4.1.4.13
- FRD 5.4.1.6.1, 5.4.1.6.2, 5.4.1.6.3, 5.4.1.6.4, 5.4.1.6.5
- FRD 5.7.1.3, 5.7.1.4, 5.7.1.6

10.4.1.3 GST3 (03/15/05)

Tied to Software Release 3 (05/01/05). Will test software and procedures for data ingest of various spacecraft data, Science Timeline generation and access to the web based GSSC FAQ.

Included Unit Tests:
- FAQ Access (W-28)

Included Subsystem tests:
- ST9 – Database Ingest III
- ST17 - Scheduling

Requirements Satisfied
- FRD 5.1.3, 5.1.4, 5.1.6
- FRD 5.2.4
- FRD 5.3.3.3.5
- FRD 5.4.1.1.2, 5.4.1.1.3
- FRD 5.4.1.4.10, 5.4.1.4.11, 5.4.1.4.12, 5.4.1.4.13
- FRD 5.7.1.8

10.4.1.4 GST4 (06/15/05)

Tied to Software Release 4 (08/01/05). Will test data ingest of all level 1 and 2 science products from the GIOC and ISOC, the GSSC observation planning tools, the web interfaces to those planning tools and the GSSC Helpdesk Administration web interface.

Included Subsystem tests:
- ST10 – Database Ingest IV
- ST11 – Database Ingest V
- ST12 – Database Ingest VI
- ST18 – Planning

Requirements Satisfied
- FRD 5.1.3, 5.1.4, 5.1.6
- FRD 5.2.4
- FRD 5.4.1.1.1
- FRD 5.4.1.4.14
- FRD 5.5.3
- FRD 5.6.1, 5.6.2, 5.6.3
- FRD 5.7.1.7

10.4.1.5 GST5 (12/15/05)

Tied to Software Release 5 (01/31/06). Will test the anomaly reports database ingest, the TOO and pager tools, and timeline database web interfaces. This test also verifies that the backup processing pipelines for the GBM and LAT which are hosted at the GSSC are functioning properly.

Included Subsystem tests:
- ST13 – Database Ingest VII
- ST16 – Commanding II
- ST23 – GBM Backup Pipeline
- ST24 – LAT Backup Pipeline

Requirements Satisfied
- FRD 5.1.3, 5.1.4, 5.1.6
- FRD 5.2.4
- FRD 5.4.1.3
- FRD 5.4.1.5.3, 5.4.1.5.5, 5.4.1.5.6
- FRD 5.6.1, 5.6.2, 5.6.3, 5.6.5

10.4.1.6 GST6 (02/20/06)

Tied to Software Release 6 (04/03/06). Will test all remaining database ingest modules and remaining GSSC website functionality.

Included Subsystem tests:
- ST14 – Database Ingest VIII
- ST19 – Web Interface I
- ST21 – GSSC User Support Tools I

Requirements Satisfied
- FRD 5.1.3, 5.1.4, 5.1.6
- FRD 5.2.4
- FRD 5.3.2.1, 5.3.2.2, 5.3.2.3, 5.3.2.9
- FRD 5.3.3.3.1
- FRD 5.4.1.5.1, 5.4.1.5.7
- FRD 5.6.1, 5.6.2, 5.6.3
- FRD 5.7.1.2

10.4.1.7 GST7 (12/04/06)

Tied to Software Release 6 (01/15/07). Will test all remaining GSSC website and User Support tool functionality.

Included Subsystem tests:
- ST20 – Web Interface II
- ST22 – GSSC User Support Tools II

Requirements Satisfied
- FRD 5.1.3, 5.1.4, 5.1.6
- FRD 5.2.4
- FRD 5.3.2.1, 5.3.2.2, 5.3.2.3, 5.3.2.9
- FRD 5.3.3.3.1
- FRD 5.4.1.5.1, 5.4.1.5.7
- FRD 5.6.1, 5.6.2, 5.6.3
- FRD 5.7.1.2

10.4.2 Ground Readiness Tests (GRTs)

The Ground Readiness Tests are designed to validate the ground system interfaces, data flows, major functionality and performance of the GLAST ground system using observatory simulators. These tests are described in detail in the Ground System Test Plan. Here we only present the GSSC-specific aspects of the individual GRTs.

10.4.2.1 GRT1 (2/15/05) – Basic Command and Telemetry to PSS Connectivity

- Data Transfer from MOC
- Ingest Level 0 HK data files from MOC
- Generate and send retransmission request

10.4.2.2 GRT2 (4/15/05) – Basic S-Band Operations

- Ingest commands and memory loads from IOCs
- Data Transfer from IOCs
- Data Transfer to MOC
- Transfer timelines and memory loads to MOC

10.4.2.3 GRT3 (6/15/05) – Basic Ku-Band Operations

- Support BAP Operations
- Timeline creation from IOC commands and memory loads
- Timeline transmission to MOC
- Ingest integrated observatory timeline from MOC

10.4.2.4 GRT4 (9/1/05) – Ground Station Operations

- Ingest of timelines and memory loads from USN and Wallops
- Burst Alert Processing

10.4.2.5 GRT5 (11/15/05) – Science Operations

- Ingest Level 1 & 2 data from IOCs
- Ingest as flown timeline

10.4.2.6 GRT6 (3/15/06) – Contingency Operations

- GSSC backup pipeline processing
- TOO handling (order creation, transmission to MOC, notification exchange)
- Ingest anomaly reports

10.4.2.7 GRT7 (5/15/06) - Regression

- Clean-up/regression testing

10.4.3 End-to-End (ETE) tests

There will be six 2-day End-to-End tests of the entire ground system. These tests are described in detail in the Ground System Test Plan. Presented here are the GSSC specific aspects of the ETE tests.

10.4.3.1 ETE1 (02/11/06) – Basic Observatory T&C

- Ingest of Level 1 data from IOCs

10.4.3.2 ETE2 (03/15/06) – Basic Command/Memory Management

- ETE1 functionality plus
- Observatory timeline/load input from IOC's to MOC
- Burst Alert handling

10.4.3.3 ETE3 (06/15/06) – Basic Observatory Operations

- ETE2 functionality plus
- TOO handling

10.4.3.4 ETE4 (08/25/06) – Advanced Operations

- ETE3 functionality regression testing

10.4.3.5 ETE5 (10/14/06) – Regression and Additional Contingencies

- ETE4 functionality
- Bug fixes

10.4.3.6 ETE6 (TBD)

- TBD

10.4.4 Data Challenges

The Data Challenges are run by the LAT team and are primarily aimed at testing the reconstruction pipeline for the LAT data and the LAT data analysis tools. During each Data Challenge, the GSSC tests its ability to receive data from the LAT IOC, ingest the data into the appropriate data storage systems, and serve the data out to the testing community from GSSC servers.

Additionally, as the GSSC is responsible for distributing the standard analysis software to the astronomical community, the release of the standard analysis software to be used for each Data Challenge is provided to the test personnel through the GSSC website.

10.4.4.1 Data Challenge 1

Held from December 2003 to February 2004, Data Challenge 1 tested the ability of the LAT reconstruction pipeline, GSSC data system and the standard analysis software prototypes to handle a single week's worth of observations. This test checked basic system functionalities.

10.4.4.2 Data Challenge 2

Scheduled for Spring 2005, Data Challenge 2 tests the ability of the LAT reconstruction pipeline, GSSC data system and the standard analysis software prototypes to handle a month's worth of data.

10.4.4.3 Data Challenge 3

Scheduled for Spring 2006, Data Challenge 3 tests the ability of the LAT reconstruction pipeline, GSSC data system and the standard analysis software to handle a year's worth of data.